A FRAGMENTED CHINA

MEASURE AND DETERMINANTS OF CHINESE DOMESTIC MARKET DISINTEGRATION

Sandra **PONCET** *†

Novembre 2002

Abstract

This paper studies the degree of integration of China's domestic market and investigates the determinants of inter-provincial trade barriers in light of endogenous trade policy theory.

I rely on a new set of provincial trade flows to develop a model which analyzes the magnitude and evolution of Chinese provinces' engagement in domestic trade by computing all-inclusive indicators of trade barriers. Results underline that not only the Chinese domestic economy is fragmented but also that local protectionism has spread between 1992 and 1997.

The investigation of province-level and industry-level trade barriers confirms the relevance of applying the framework of endogenous protection to explain the level of impediments to trade between Chinese provinces. Our findings emphasize that provinces' domestic trade protection pursues a dual objective of socio-economic stability preservation and fiscal revenues maximization.

JEL Codes: F02, F14, F15, O52, R58.

Keywords: Chinese provinces, domestic integration, border effects.

*Centre d'Etudes et de Recherches sur le Développement International. 65 bd F. Mitterrand - 63000 Clermont-Ferrand. Tel: (33) 4 73 17 75 01. Fax: (33) 4 73 17 74 28. Email: s.poncet@cerdi.u-clermont1.fr

†My thanks go to Barry Naughton for sharing with me provincial Input-Output tables for 1992 and for helpful discussions. I am greatly indebted to Marcel Fafchamps for solving the aggregation problems of the model.

Résumé

Ce travail étudie le degré d'intégration du marché intérieur chinois et examine les déterminants des barrières au commerce inter-provincial à la lumière de la théorie de la protection commerciale endogène.

On se base sur des nouvelles données de flux commerciaux provinciaux pour développer un modèle qui analyse l'ampleur et l'évolution de l'engagement des provinces chinoises dans les échanges intérieurs en calculant des indicators globaux d'entraves au commerce. Les résultats soulignent non seulement que l'économie chinoise est fragmentée mais surtout que le protectionnisme local s'est accru entre 1992 et 1997.

L'étude des entraves commerciales par province et par secteur confirme la pertinence de l'application de la théorie de la protection endogène pour expliquer le niveau des entraves entre les provinces. Nos résultats mettent en évidence que la protection du commerce intérieur par les autorités provinciales poursuit un double objectif de préservation de la stabilité socio-économique et de maximisation des recettes fiscales.

Mots clés: Provinces Chinoises, intégration interne des marchés, intégration régionale, effets frontière.

1 Introduction

The economic reforms initiated by Chinese authorities in the late 1970s promoted spatial domestic market integration alongside state withdrawal, economic modernization and international openness. They broke dramatically with the Maoist introverted development strategy. In pre-reform China, the emphasis was placed on planning, autarky and regional self-sufficiency. China's duplicative domestic market was referred as cellularized along the provincial borders. Some reforms, notably trade and financial opening to the World economy moved forward very quickly. Achievements in internal reforms are less obvious. Specifically, some authors express their concerns about the degree of economic integration between Chinese provinces.

The magnitude of regional integration in China and the transformation of the country into a unified, fair and regulated market as it joins the World Trade Organization take on particular importance, since China's international opening can only be effective if goods are traded freely inside the country.

Relying on indirect analyses of price and provincial economic structures data, Young (2000) makes the extreme assertion that over the past 20 years of economic reform China, has evolved into "a fragmented internal market with fiefdoms controlled by local officials". This claim was put forward early on based on similar data by World Bank (1994)'s report on China's internal market development. Huang (2002) bears out the same thesis of decreasing inter-regional economic integration.

Local protectionism is a topical issue as proven by recent declarations of top ranked officials

and the ban of local protections by a directive of the cabinet[1]. It is however hard to move beyond the anecdotes and to obtain a concrete measure of intra-national protections.

The claim of increasing fragmentation in China is received with skepticism by China's specialists. Reports of rising regional trade barriers run strongly counter to the perceptions of informed observers of the Chinese economy. Notably they fly in the face of the visibly successful efforts by both foreign multinationals and emerging Chinese enterprises to build national distribution networks and establish nationally recognized brands.

Overturning conventional wisdom requires very solid empirical work. So far, papers supporting the counter-intuitive thesis of decreasing integration in China suffer from the lack of direct data and interpretation problems. To our knowledge, there is presently no direct study on the degree and evolution of domestic market integration in China. Naughton (1999) does examine inter-provincial trade flow extracted from provincial input-output tables. He argues that Chinese domestic trade is not only large, but also is dominated by intra-industry trade in manufactured products. This finding is consistent with the view of an integrated national economy. Naughton's study is, however, limited to the year 1992, falling short of analyzing the evolution of impediments to trade within China since the deepening of the reforms[2].

In this paper, I assess the magnitude and evolution of Chinese market integration in the 1990s based on a new inter-provincial trade data set. I then investigate the determinants of internal trade barriers in light of endogenous trade policy theory.

I tackle the issue of regional integration within China head on relying on an updated version

[1]-At the annual session of the National People's Congress in March 2000, Wang Zhongfu, director of the State Administration for Industry and Commerce, pointed out that "administrative monopolies, forced deals and market blockades have become a cancer in China's market" (People's Daily July 1st, 2000). More recently, in April 2001, the State Council issued a directive to outlaw regional blockades in market activities.

[2]The author provides a tentative comparison with some data for 1987. Their inferior quality and greater aggregation cast however doubt on the comparability of the two series.

for 1997 of the IO data used by Naughton. I compute all-inclusive indicators of province-level and industry-level trade barriers for 1992 and 1997 using the border effects method.

The literature on border effects was pioneered by McCallum (1995) to measure the trade-diminishing effects of the Canada-US border. It has been adapted to measure the degree of integration between and within sovereign countries (Helliwell (1997) on Canada, Wolf (2000) on the US, Wei (1996) between OECD countries and Head and Mayer (2000) on the EU). These analyses all find rather large border effects, however declining over time, in line with increased trade liberalization.

I apply this method to evaluate whether Chinese economic reforms were successful or not in promoting domestic market integration.

Each province is considered an integrated economy within its boundaries while its frontiers hinder trade flow with the outside. The domestic integration of Chinese provinces is thus evaluated using the volume of intra-provincial trade flow as the reference. The trade-diminishing effect of Chinese provincial borders is measured as the "excessive" trade volume observed within a province in relation with what would be expected from the model in absence of impediments to trade[3]. The model is then modified to take into account the role of public versus private consumption in the provincial preference for local goods.

It appears that not only the trade-diminishing impact of provincial borders is high but above all it has increased between 1992 and 1997 in the quasi totality of provinces and industries. This finding contrasts with results obtained on other economies (Canada, USA, European Union, OECD). Despite the promotion of spatial integration by authorities, domestic trade

[3]Specifically I refer to the proportion by which a province consumes more local goods than goods from the other provinces.

flow intensity inside China has declined between 1992 and 1997: locally produced goods supply a growing share of the local consumption to the detriment of goods produced in the rest of the country.

Computed border effects are taken as proxies of impediments to internal trade. The study of their determinants confirms the relevance of applying the framework of endogenous protection to explain the level of barriers to trade between Chinese provinces. On the demand side of trade protection, provincial unemployment rate and public sector size as well as industry-level fiscal contribution and labor intensity are significant determining factor of the protection level against imports from the rest of China. On the supply side of protection, the higher the provincial share of public consumption and financial autonomy, the greater the barriers on domestic trade. Chinese local governments, whose economic powers have expanded with decentralization, pursue a dual strategy of socio-economic instability minimization and tax revenues extraction.

This paper proceeds as follows: section 2 briefly describes Chinese market economic fragmentation and presents the actors of the decision-making process of domestic trade policy. Section 3 develops the empirical model used to measure provincial and industry-level border effects and its adaptation to take into account the impact of public consumption on trade. Data sources and variables construction method are then presented. Section 5 measures the magnitude of border effects in China while section 6 explores their determinants.

2 Political economy of domestic trade fragmentation in China

China's economy is characterized by its "cellular" structure due to its horizontal principle of economic management. It is traditionally based on a territorial or regional planning where local authorities govern most economic activities in one geographic region across different economic sectors. Chinese provinces are natural entities and even political regions in that they constitute socio-political entities. Their territories and residents are ruled by a specific power invested with increasing administrative and political functions since the decentralization process. The borders of the thirty-one Chinese provinces[4] delimit so many separate markets. The decentralization reforms initiated in 1980 reinforced China's de facto economic federalism as more regulatory responsibilities, ownership of firms, economic and financial powers were placed in the hands of provincial governments. Under the name of assistance to the local economy, local governments used their heightened administrative powers (in terms of trade, investment, budget and price fixation) to implement a multiform protection of workers and enterprises under their authority (Zhao and Zhang, 1999). Alright import bans, discriminatory product and health certification standards, tariffs and dumping charges, confiscations of profits earned on marketing foreign-provincial goods as well as subsidies to local commercial units for buying locally-produced products aimed at curtailing competition with home-province products and sustaining employment and the survival of uncompetitive local enterprises (Wedeman, 2002 and Chinese Economic Studies, 1994). Local authorities often justified their protectionist measures

[4]China is divided into thirty-one provincial-level administrative entities. They include five autonomous regions *zizhiqu*, twenty-two provinces *sheng* and since 1997 four provincial-level municipalities *zhixiashi*(Shanghai, Tianjin, Beijing and Tchonqing located in Sichuan province).

by their regional import substitution strategies. These provincial policies, just as those at the national level, intended to develop import-replacing infant industries at home in the shelter of trade restrictions. Duplication of under-optimal enterprises, convergence of industrial production across different regions, wastefulness and territorial segmentation along provincial border logically arose.

The rough data on domestic trade from provincial Input Output Tables confirm that domestic trade is large but declining over the period 1992-1997. Average Chinese inter-provincial imports amount to 50 and 38 % of GDP respectively in 1992 and 1997. Inter-provincial trade makes up 80 and 66% of total trade in these years.

The value of internal trade in China increased between 1992 and 1997, yet at a lower rate than GDP, international trade and intra-provincial trade. Between 1992 and 1997, the share of imports from other provinces in total goods absorption decreased. In 1992, average provincial absorption of goods was composed as follows: 27% of goods produced in other provinces, 68% of locally made products and 5% of international imports. In 1997, the importance of goods from the rest of China in provincial absorption declined to 20% while the shares of locally-produced goods and foreign goods rose to 72 and 8%, respectively.

The decrease in inter-provincial trade intensity is consistent with the rapid international trade opening of Chinese provinces. However, the fact that it goes hand in hand with the rise of intra-provincial trade intensity raises doubts on effective domestic market integration. As mentioned earlier, the promotion by Chinese reforms of domestic openness alongside international openness was motivated by the search for dynamic and static gains resulting from increased competition, the diffusion of technological progress and the determination of production according to comparative advantages. Pre-reform introverted development policies resulted

in inefficient and non-competitive local products as production completely neglected principles of comparative advantage, economies of scale and specialization. International imports are expected to substitute both for production in other Chinese provinces (domestic trade) and for local production (intra-provincial trade). One may expect the substitution effect to be larger for local goods than for goods for the rest of the country. In parallel, domestic integration should also foster competition between domestic and local products, to the advantage of the firsts.

Findings of decreasing inter-provincial trade intensity beside rising intra-provincial trade intensity between 1992 and 1997 run counter to the logic of regional specialization according to comparative advantages and economies of scale. They support the claim of growing economic fragmentation in China.

The theory of endogenous trade policy is used to understand the logic of local authorities' protectionism. It contends that governments when deciding trade policies do not only pursue economic efficiency but also consider income distributional consideration. Trade protection is endogenously determined by the relationship between a demand (from private agents and interests groups) and a supply (from politicians and government).

Numerous empirical studies examine the political-economy determinants of trade protection at the national level[5], some of which on developing economies like South Korea, Taiwan and Mexico. However, there are only a few applications of the endogenous trade theory to China

[5]Baldwin (1984) and Rodrik (1995] provide excellent surveys of this literature.

(Branstetter and Feenstra, 1999[6], Chen and Feng, 2000[7], Bin, 2001). They focus exclusively on international trade.

This paper offers a first attempt to investigate the determinants of trade protection adopted internally by Chinese provinces. The logic of above-cited studies can be taken up to apprehend provincial domestic trade protectionism. They all emphasize the importance of the objective of economic and political stability in the trade policy management. Economic reforms highlight the over-employment and the lack of profitability of numerous enterprises especially state-owned ones. Due to soft budget constraint and historical management failures, more than half of public enterprises are now running a deficit. Most of them are directly controlled by the authorities of their jurisdiction. These regional enterprises (*difang qiye*) entertain close ties with the local government which favor blackmailing practices and lobbying for more protection. I argue that trade policy is used by provincial authorities as a tool to minimize threats of massive layoffs, bankruptcies and reduced competitiveness of local enterprises induced by liberalization and privatization processes. As such, protection is expected to be extended in priority to high employment and inefficient sectors. I further consider the importance of the fiscal revenue objective. Indeed, previous studies on China's international trade policy find that trade policy

[6]This paper derives a model inspired from Grossman and Helpman (1994) and views the political process in China as trading off the social benefits of increased international opening against the loss incurred by state-owned enterprises. These authors treat Chinese provinces as distinct due to the limited economic integration between them and their trade policy autonomy.

[7]This paper legitimates applying endogenous trade theory to Chinese economy despite the apparent lack of political competition among parties in the country. The authors set out three reasons to examine China's trade policy in the endogenous context although popular support does not seem to be needed to remain in or to gain political office. First, high-performance record strengthens government's legitimacy and trade policy is a tool used by provincial authorities to ensure good results in terms of growth and employment. Second, economic reforms create losers through massive layoffs, inflation and decreasing enterprises' profitability. Trade policy may help to limit the competition and preserve political and social stability. Third, with the decentralization process, new actors (enterprises, industrial associations and local governments) have emerged and gained financial and political power. Lobbying activities mainly take place between enterprises and authorities by the means of persuasion, protest and bargaining. The negotiation strength of enterprises depends non only on their nature and status but also on their network (*guangxi*) with competent officials.

pursues the maximization of government revenues beside the preservation of social stability and economic equity.

Our findings will confirm the relevance of endogenous policy trade theory in the Chinese domestic market context. They also shed light on the appropriate strategy for the central government to undertake in order to fight against local protectionism and promote domestic market integration.

3 The border effect model

3.1 Basic Model

I follow the model proposed by Head and Mayer (2000) to measure trade integration between European countries. Their specification is now probably the cutting-edge implementation in that it develops the estimating equation from first principles and takes into account that prices of third nation goods can affect bilateral trade flows.

Head and Mayer (2000) adopt a monopolistic competition framework inspired by Krugman (1980) and derive a gravity equation from a utility function allowing for asymmetric consumer preferences.

The C.I.F. value of imports of province i from partner j, m_{ij}, is obtained through the maximization of the following CES utility function under the budget constraint:

$$U_i = \left(\sum_{j=1}^{N} \sum_{h=1}^{n_j} (a_{ij} c_{ijh})^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}} \; s.t. \; m_i = \sum_k m_{ik} = \sum_k c_{ik} p_{ik} \forall \; h \tag{1}$$

with k covering all partners so that k=1, i, j,... N, σ the elasticity of substitution between any two varieties and p_{ik}, the delivery price of imports from k by i.

I obtain the bilateral imports of i from j by summing imports for each variety, with n_j is the number of varieties in j:

$$m_{ij} = \frac{a_{ij}^{\sigma-1} n_j p_{ij}^{1-\sigma}}{\sum_k a_{ik}^{\sigma-1} n_k p_{ik}^{1-\sigma}} m_i. \tag{2}$$

A gravity equation is derived from this expression after taking into account the proportionality $n_j p_j = \frac{v_j}{q}$ between production v_j and the number of varieties n_j yielded by the Dixit-Stiglitz (1977) model[8] in order to eliminate n_j and n_k terms.

The price paid by consumers in province i for goods produced in partner j is defined as a multiplicative function of production price in j, p_j, the distance between the two partners d_{ij} and trade barriers (tariff and non-tariff) applied by province i on its imports from j. Constant ad valorem barriers of u are assumed for all cross-border trade so that p_{ij}=$(1+u)d_{ij}^{\delta} p_j$.

Trade barriers u are supposed to be null inside provinces ($j = i$) but positive if $i \neq j$. Let B_{ij} be a dummy variable that equals one when trade flows cross borders and zero otherwise, that is to say $B_{ij} = 1$ when $i \neq j$ and $B_{ii} = 0$. One obtains :

$$m_{ij} = \frac{a_{ij}^{\sigma-1} v_j \left(B_{ij}\,(1+u)\,d_{ij}^{\delta}\right)^{1-\sigma} p_j^{-\sigma}}{\sum_k a_{ik}^{\sigma-1} v_k \left(B_{ik}\,(1+u)\,d_{ik}^{\delta}\right)^{1-\sigma} p_k^{-\sigma}} m_i \tag{3}$$

I specify a_{ij}, the preference weight of consumers in i for products imported from j[9] as composed by a domestic bias (noted DB_{ij}) and by an error term normally distributed ϵ_{ij} : a_{ij}=exp(DB_{ij}+ϵ_{ij}). Let $DB_{ij} = 0$ when $i = j$ (intra-provincial trade) whereas it is negative when $i \neq j$ so that $DB_{ij} = -\beta_i$. In this latter case, consumers prefer local goods to outside

[8]In the model of monopolistic competition, the quantity of production (noted q) is identical for every firm. With v_j the production value in j, one obtains the equality $v_j = q p_j n_j$.

[9]This consumer utilities specification allows heterogeneity in bilateral preferences and enables consumers to value products differently depending on their origin.

goods and experience a positive aversion β_i vis-à-vis products imported from the other side of the frontier.

I follow Head and Mayer (2000) in adopting a relative specification to overcome estimation problems of the denominator. The authors transform the gravity relationship into relative terms with respect to intra-provincial trade flow m_{ii}.

Substituting for all the previously defined terms in the definition of m_{ij} and transforming the equation into logarithms leads to:

$$\ln \frac{m_{ij}}{m_{ii}} = \ln \frac{v_j}{v_i} - \delta(\sigma - 1) \ln \frac{d_{ij}}{d_{ii}} - \sigma \ln \frac{p_j}{p_i} - (\sigma - 1)[\beta_i + ln\,(1 + u)] + e_{ij} \qquad (4)$$

$$with \quad e_{ij} = (\sigma - 1)\,(\epsilon_{ij} - \epsilon_{ii})$$

The constant term in equation 4 is expected to be negative as it represents the deviation of observed inter-provincial trade flows from their predicted value in absence of barriers by the model, based on intra-provincial trade. It includes the effect of tariff and non-tariff barriers u as well as the impact of aversion to domestic goods β_i.

3.2 Considering public consumption importance

The basic equation can be enhanced through the definition of the local bias of consumption in light of the endogenous trade policy theory. The supply of protection by a provincial government is assumed to depend on its interventionism in the economy captured through the share of public sector in the provincial consumption.

Equation 4 is easily modifiable to take into account the respective shares of the public and private sectors in the consumption and the specific values of their domestic bias. Let $\beta_i = \beta_i^{pub} * \alpha_i + \beta_i^{priv} * (1 - \alpha_i)$, with α_i the share of the public sector consumption in province

i and β_i^{pub} and β_i^{priv} the aversion vis-à-vis outside products of public and private consumers respectively. Equation 5 follows:

$$\begin{aligned} \ln \frac{m_{ij}}{m_{ii}} &= \ln \frac{v_j}{v_i} - \delta(\sigma-1) \ln \frac{d_{ij}}{d_{ii}} - \sigma \ln \frac{p_j}{p_i} - (\sigma-1)\left[\alpha^i \beta_{pub}^i\right] \\ &\quad - (\sigma-1)\left[\left(\alpha^i - 1\right)\beta_{priv}^i + ln\left(1+u\right)\right] + e_{ij} \\ &\quad with \quad e_{ij} = (\sigma-1)\left(\epsilon_{ij} - \epsilon_{ii}\right). \end{aligned} \tag{5}$$

The constant term (taken as a proxy of domestic trade barriers) is purged from the impact of the public consumer's aversion towards outside goods. It captures private consumer's aversion beside trade barriers. A decrease in the border effect would be consistent with greater preference for local goods from the public sector.

4 Data sources and variables construction

Most Chinese provinces produced square input output tables for 1992 and 1997. A few of them are published in provincial statistical yearbooks. I obtained access to final-demand columns of these matrices from the input output division in China's National Bureau of Statistics.

They provide the decomposition of provincial output, international and domestic trade for 21 comparable industries of tradable goods in 1992 and 1997[10]. Domestic trade flows, that is trade between each province and the rest of China[11], were obtained for 25 provinces in 1992

[10] In 1997, a total of 40 industries are considered against 33 in 1992. This study concentrates on industries of tradable products and thus excludes service sectors.

[11] No data on bilateral trade flow between provinces are available. The model will not estimate the impact of provincial borders on trade flow between provinces that they separate but the effect of each province's boundaries on its trade with all other provinces.

and 24 provinces in 1997[12].

The rest of China, denoted by roC, differs for each province considered and can be thought of as a distinct country whose characteristics (production V_{roC}, production price p_{roC} and distance to partners d_{i-roC}) can be generated on the basis of the characteristics of the provinces that make it up. As such its production V_{roC} corresponds to the sum of the productions v_j of its constitutive provinces j: $V_{roC} = \sum_{j \neq i} v_j$.

To avoid a somewhat ad hoc way of aggregating provincial characteristics, expressions of other rest of China's characteristics are derived directly from the model, on the ground that $m_{i-roC} = \sum_{j \neq i} m_{ij}$ with i and j being Chinese provinces. Equation 3 gives:

$$m_{ij} = \frac{exp\left(-\beta + \epsilon_{ij}\right)^{\sigma-1} v_j \left(B_{ij}\left(1+u\right) d_{ij}^{\delta}\right)^{1-\sigma} p_j^{-\sigma}}{\sum_k exp\left(-\beta + \epsilon_{ik}\right)^{\sigma-1} v_k \left(B_{ik}\left(1+u\right) d_{ik}^{\delta}\right)^{1-\sigma} p_k^{-\sigma}} m_i$$

The notation can be simplified in setting $\theta = \delta(\sigma - 1)$ and in letting $\gamma = exp\left(-\beta + \epsilon_{ij}\right)^{\sigma-1} \left(1+u\right)^{1-\sigma}$, so that $m_{i-roC} = \frac{\gamma \sum_{j \neq i} v_j d_{ij}^{-\theta} p_j^{-\sigma}}{\sum_k a_{ik}^{\sigma-1} v_k \left(B_{ik}(1+u) d_{ik}^{\delta}\right)^{1-\sigma} p_k^{-\sigma}} m_i$.

The presence of the unknown distance-decay parameter θ and the price elasticity σ inside the summation complicates the deduction of an estimable equation. In order to avoid relying on arbitrary values of θ and σ, I hypothesize that the weighted arithmetic mean $\sum_{j \neq i} \frac{v_j \left[d_{ij}^{-\theta} p_j^{-\sigma}\right]}{V_{roC}}$ can be proxied by the weighted geometric mean $\prod_{j \neq i} \left[d_{ij}^{-\theta} p_j^{-\sigma}\right]^{\frac{v_j}{V_{roC}}}$[13].

[12]IO tables are available for 28 provinces as data are missing for Tibet, Hainan and Tchongqing). Three provinces in 1992 (Anhui, Heilongjiang and Inner Mongolia) and four in 1997 (Anhui, Heilongjiang, Shandong and Guizhou) list only net outflows and are thus not useful for studying inter-provincial trade. Eleven provinces in 1992 and seven in 1997 separate inflows and outflows into domestic and foreign sectors. I have deduced domestic trade flows for the other provinces using industry-level provincial import and export data from the General Administration of Customs. These data match the data reported as international trade by provinces that separate international and domestic transactions in their input-output tables. This finding gives some confidence in the method used as input-output tables and customs data appear to use consistent methodology.

[13]Recall that $\sum_{j \neq i} \frac{v_j}{V_{roC}} = 1$. It is true that the geometric mean always yields results inferior to those given by the arithmetic mean. However, the degree of underestimation is all the lower that $d_{ij}^{-\theta} p_j^{-\sigma}$ is small. In our case it is quite close to zero. In the literature, estimates of the distance elasticity of trade place $\theta = \delta(1-\sigma)$ between 0.5 and 1.5 while estimates of the elasticity of substitution between varieties σ range between 6 and 11.

In the absence of correlation between d_{ij} and p_j[14], m_{i-roC} is almost equivalent to the expression $\frac{\gamma V_{roC} \prod_{j \neq i} d_{ij}^{-\frac{v_j}{V_{roC}}\theta} \prod_j p_j^{-\frac{v_j}{V_{roC}}\sigma}}{\sum_k a_{ik}^{\sigma-1} v_k \left(B_{ik}(1+u) d_{ik}^{\delta}\right)^{1-\sigma} (p_k)^{-\sigma}} m_i$.

Transforming the relationship into relative terms with respect to intra-provincial trade flow m_{ii}, taking logarithm of this expression and letting $v_{j*} = \frac{v_j}{v_{roC}}$ the share of j in the output of the rest of China, I obtain for each industry:

$$\ln \frac{m_{i-roC}}{m_{ii}} = \ln \frac{v_{roC}}{v_i} - \theta \ln \frac{\prod_{j \neq i} d_{ij}^{v_{j*}}}{d_{ii}} - \sigma \ln \frac{\prod_{j \neq i} p_j^{v_{j*}}}{p_i}$$
$$- (\sigma - 1) \left[\beta + ln\,(1+u)\right] + e_{ij}, \quad with \quad e_{ij} = (\sigma - 1)\left(\epsilon_{ij} - \epsilon_{ii}\right).$$

It follows that the formula for the effective distance between each province i and the rest of China d_{i-roC} is given by the production-weighted geometric mean $\prod_{j \neq i} d_{ij}^{v_{j*}}$ of bilateral distances d_{ij} between i and the other Chinese provinces j.

For a given industry, the average production price inside the rest of China, p_{roC}, equals the production-weighted geometric mean $\prod_{j \neq i} p_j^{v_{j*}}$ of production prices p_j in the provinces that form the rest of China. Industry-level production prices are proxied by average wages in current yuan extracted from provincial statistical yearbooks[15]. Relying on comparable data on wages as proxy for production prices definitely constitutes a improvement from traditional estimations. Gravity models with few exceptions completely overlook the influence of prices. When they do not, they usually rely on data on Consumer Price Index[16], that fail to provide information on the level of prices.

---

[14] I find a coefficient of correlation lower than 0.02 that allows me to set $\prod_{j \neq i} \left[d_{ij}^{-\theta} p_j^{-\sigma}\right]^{\frac{v_j}{V_{roC}}} = \prod_{j \neq i} d_{ij}^{-\frac{v_j}{V_{roC}}\theta} \prod_j p_j^{-\frac{v_j}{V_{roC}}\sigma}$.

[15] These yearbooks provide wages for agriculture, extraction activities and industry.

[16] The use of wages admittedly disregards issues of capital. However it could appear quite reasonable in the case of China. as Chinese economic activities are predominantly labor intensive. Provinces should furthermore benefit from similar access to capital as credit allocation in China is made on a national basis by a small number of state owned banks.

Intra-provincial industry-level trade flows m_{ii} are measured following Wei (1996)'s method, that is by subtracting the province's total exports (to domestic and foreign partners) from production for each industry[17].

Moreover, I elaborate a measure of intra-provincial distance that solves the various drawbacks of methods used so far in the literature and has the advantage of not only being derived directly from the model but also to take into consideration the province-specific distribution of economic activities.

Intra-provincial distance d_{ii} is computed consistently with the model without relying on arbitrary values of θ. It is the production-weighted geometric mean of bilateral distances between prefectures[18]: $d_{ii} = \prod_{l \in i} d_{li}^{\frac{v_l}{v_i}}$ with $d_{li} = \prod_{m \in i} d_{lm}^{\frac{v_m}{v_i}}$. The appendix explains more in detail the computing logic and hypotheses.

Distances between provinces and prefectures are measured on the basis of real distance by road in kilometers between their capital cities. They are computed following the shortest itinerary and the most rapid roads based on very detailed maps. This method helps to control for the fact that quality of transport infrastructures varies enormously across and within provinces. The introduction of distance under a logarithmic form allows to take into account the decreasing marginal cost of distance on trade.

Sectoral heterogeneity in the response of trade to transport costs and production prices (proxied by distance and wages respectively) will be considered in the empirical estimation.

[17]The production that remains within the local boundaries (not exported) is at the same time equal to imports "from itself " and exports "to itself ". Intra-provincial trade is thus to be calculated as : gross value of goods production minus international and domestic exports of goods for each industry.

[18]In China, provinces are sub-divided into prefectures. Data on GDP of prefectures are taken from *Cities China 1949-1998*. Bilateral distances between prefectures l and m are measured on the basis of real distance by road in kilometers between their capital cities.

5 Domestic border effects estimation

I apply the basic model of border effects (equation 4) to the Chinese context to estimate the level and evolution of its domestic market integration. Industry-level and province-level all-inclusive summaries of inter-provincial trade barriers are computed for 1992 and 1997.

Results are reported in table 1. Columns 1 to 3 correspond to a panel specification with industry-based fixed effects where a time dummy variable differentiates between 1992 and 1997. While column 1 imposes a common coefficient on the various explanatory variables, column 2 allows for sectoral heterogeneity. Column 3 goes further and introduces coefficients by year and industry.

Next columns (4 and 5) opt for a panel specification with fixed effects by couple of industry-year[19]. This specification does not allow anymore to observe readily the 1992-1997 change in the border effect.

The Huber/White/sandwich estimator of variance is used to correct potential heteroskedasticity. The Davidson-MacKinnon test does not reject the null hypothesis of absence of endogeneity of production[20].

Coefficients are quite consistent with their predicted values. The test of linear hypothesis does not reject that the coefficient on distance corresponds to the -0.6 considered by Leamer (1997) as the normal elasticity. The coefficient on relative production is close, though significantly different, from its theoretical unitary value.

[19]The Breusch Pagan test (Lagrange multiplier test) underlines the presence of specific industry-level effects that vary in time.

[20]Output and trade are jointly determined in equilibrium (Harrigan, 1996). This could lead to a correlation between relative production and the error term. Lagged production and number of employees by industry and province are used as instruments. The test of overidentifying restrictions does not reject the validity of the choice of instruments.

The good performance of the relative price variable can be underlined. Its coefficient, representing $-\sigma$, the substitution elasticity between varieties, though lower than the theoretical prediction (between -5 and -10 according to different estimation methodologies) is far superior to that obtained by studies based on the model of Head and Mayer (2000) on the EU. This econometric result can be explained by the fact that the analysis is centered on sub-units of a given country. Production prices are labeled in the same currency, with no need of exchange rate conversion like in international studies.

The constant term in the model corresponds to the average border effect in Chinese domestic market. The border effect between a province and the rest of China can be interpreted as the impeding-impact of the province's boundaries on its trade with all the other Chinese provinces taken as a whole. I quantify border effects following McCallum (1995) in using the ratio of imports from self to imports from others, holding other things equal. This consists in taking the exponential value of the estimated border effects. I will attach less importance to the interpretation of the measured impact of provincial borders on domestic trade than to the analysis of its evolution over time and its inter-industry and inter-provincial variability.

Results in columns 1 to 3 show that the average border effect (across provinces and industries) rose significantly between 1992 and 1997. This finding is robust in specifications that authorize specific responses of trade to traditional gravity forces (output, distance and price) by industry and industry cross year. The increase in trade impediments within China appears even more significant when coefficients are allowed to vary by year (column 3) .

This finding of rising internal trade barriers inside China is confirmed by results in the following columns (panel with fixed effects by industry and year) when the average border effect that appears in the column is differentiated depending on the year. Specification of

column 4 is taken as the reference. The average border effect is equal to exp(3.25) over the period. It increases from 22 [exp(3.09)] in 1992 to 30 [exp(3.39)] en 1997. Thus, after controlling for transport costs, production and production price, Chinese provinces turn out to consume around 22 times more locally-produced goods than goods from the rest of China in 1992 against 30 times more in 1997, across industries.

The border effect level can be made more explicit through its expression in tariff-equivalent. The estimate of the ad-valorem value of the border effect is computed as exponential of [border effect/$(\sigma - 1)$]-1. This computation requires an assumption about the elasticity of substitution σ. Relying on $\sigma = 9$ [21], I find that the tariff-equivalent of crossing a border between a province and the rest of the country amounts to 47 and 52% in 1992 and 1997 respectively. These figures lie close to the value of 45% found for the European Union and the Canada-US border in the beginning of the 1990s.

The trade impeding impact of provincial borders in China turns out to be closer to that of borders existing between independent sovereign countries than to that measured between sub-national regions inside individual countries. Studies on internal trade in US and Canada find tariff-equivalents inferior to 15%. Integration between different countries is slowed down by their nationalism, by the heterogeneity of their institutions, norms and legislations as well as by linguistic and cultural differences between them. These factors should not be at work or should have a lower impact on trade in a single unified country. Identical tariff-equivalents in China and in the EU during the 1990s correspond to a lower market integration achievement in China than in Europe and thus emphasize the fragmentation of Chinese economy. More

[21] Head and Ries (2002) find values of σ ranging between 7 and 11. Head and Mayer (2000) rely on $\sigma = 9$ and find a tariff-equivalent between 37 and 45% for European countries. Wei (1996) computes a tariff-equivalent of the border effect between OECD countries using $\sigma = 20$ because of the predominance of intra-industry trade in the trade flow of these countries. He finds a tariff-equivalent of 5%.

importantly, the rise of domestic border effects between 1992 and 1997 contrasts with results obtained for other trade zones. They all evidence decreasing internal trade barriers coherent with their engagement in trade liberalization agreements. The increasing deviation between the observed and expected domestic trade flow inside China proves the failure of Chinese authorities to promote domestic openness and crush economic structure fragmentation along the provincial limits. It supports the thesis of a move towards the disintegration of China's domestic market. Locally produced goods supply a growing share of the local consumption to the detriment of goods produced in the rest of the country. This evolution runs counter to the logic of regional specialization according to comparative advantages and economies of scale.

I proceed to check the pertinence of the analysis of domestic trade in China in terms of endogenous trade policies. Column 5 estimates equation 5 of the model after distinguishing between public and private consumption bias. I introduce public sector's share in total provincial consumption[22]. The greater this share, the more protectionist the province should be. Indeed, public authorities and thus the state sector are expected to be more sensitive to the concept of local market protection. State-Owned Enterprises (SOE) are traditionally more inclined to give priority to a local supply against foreign imports and to follow discriminatory practices within the framework of investments, tenders or market allocation. The importance of the public sector consumption also proxies the magnitude of governmental interventionism in the provincial economy. Greater public sector consumption corresponds to a less advanced stage of state withdrawal. The expected sign on this variable is negative as public enterprises are more inclined to call for trade protectionism and to discriminate against imports of goods from the

[22]This variable only has a provincial dimension since information on public consumption with the double dimension province/industry do not exist. It is extracted from the China Statistical yearbooks.

rest of the country. After the share of public sector consumption is introduced in the regression, the domestic bias included in the average border effect only captures that of the private sector. It logically turns out smaller. The decomposition between public and private consumption reduces the border from exp(3.25) (column 4) to exp(2.59) (column 5). These results confirm the negative impact of the influence of the state in the economy on domestic market integration. Symmetrically, it proves how privatization and the withdrawal of the state may promote the reduction of impediments to inter-provincial trade.

The dissociation of yearly average border effects between industry-level and province-level yearly effects sheds light on the spatial and industry-based disparities of impediments to inter-provincial trade. It should improve our undertanding of this move towards domestic disintegration in China. Industry-level border effects correspond to the fixed effects of the panel regression (column 4). The yearly provincial border effects are retrieved by regressing the sum of the yearly global border effect and residual from the panel equation on the entire set of dummy variables of couple province-year. The value of the coefficient specific to each province cross year is the specific border effect for a given province and a given year. P-values are deduced from standard errors of the regression.

Industry- and province-level border effects appear in table 2.

This industry-level border effects hierarchy is quite logical since Chinese domestic market is found to be the least integrated for goods that are either difficult to transport (building materials, power and water) or that have been involved in trade conflicts reported in the literature. Inter-provincial trade tensions and protectionist policies concerned in priority agricultural goods and light low technology industrial goods subject to regional import substitution strategies such as metal product. The four highest increases of industry-level border effects are found

in wood products and furniture, food processing, non metal minerals extraction (wood, salt, stone...) and metal products industries. These results are in line with provincial strategies of import-substitution, maximal exploitation of their natural resources and on site transformation conducted by local authorities.

On the opposite, greater inter-provincial trade intensity is observed for goods which production is localized in a limited number of provinces, notably because of high technological content and capitalistic intensity (petroleum refining, metal smelting and electronic and telecommunications). Other provinces are bound to get their supplies from outside their borders for these goods.

The hierarchy of yearly provincial border effects also appears consistent with provinces features and profiles stated in various studies (Goodman and Segal, 1994, Yang, 1997 and Cheung, Chung and Lin, 1998) and in stories on trade tensions. Lowest border effects and thus higher economic integration with the rest of the territory are found for coastal provinces of Guangdong, Jiangsu and Hebei, Jilin province and for two municipalities (Shanghai and Tianjin). These two provincial-level cities are two important harbors and privileged exchange places (stock exchange in Shanghai). In China, the coastal dimension not only encompasses more developed transport infrastructure but also higher engagement in economic liberalization and restructuring. Our results confirm that more liberalized coastal provinces logically display lower impediments to trade.

Landlocked and depressed western provinces are characterized by greater impediments imposed on their imports from the rest of the nation: Qinghai, Yunnan, Shanxi and Ningxia provinces consume at least 40 times more local goods than goods imported from other provinces even after transport costs, wage and wealth differences (that is four times more than the coastal

provinces mentioned above). These interior resources-rich provinces suffered greatly from distorted central policies (undervalued raw materials prices, preferential taxation for the coast, investment and reforms biased in favor of coastal regions). They resorted to autarchic policies (import substitution and protectionism) to make up for the perceived unfairness and developed their own transformation industries in the shelter of trade restrictions.

Coastal province of Fujian as well as its neighbor Zhejiang also distinguish themselves by high impediments to domestic imports. These features can probably be explained by geographical and cultural factors. These mountainous provinces are bordered in the north and south respectively by the high chain of Wuxi Shan, so that Fujian is physically isolated from the rest of China, all the more that until recently no railway line connected Fujian and neighboring Guangdong. Huge disparities divide these two provinces into a liberalized and high-growth coastal fringe and an autarkic and remote mountainous inside. Fujian and Zhejiang actively participated to trade conflicts on various goods such as the "silkworm cocoon war" and "grain war" that occurred at the end of the eighties. They resorted to various protectionist measures to protect their home products from the competition of goods from their dynamic neighbors (Guangdong for Fujian and Shanghai for Zhejiang). Long (1994) moreover argues that the proximity with Taiwan has played against market integration with the rest of China. The long ban on ties with the enemy island induced poverty and tension in the neighboring Chinese provinces that tend to explain that they resorted as numerous interior provinces to protectionist measures. Furthermore, when trade was finally allowed between Fujian and Zhejiang and their natural partner Taiwan, it may have developed at the expense of exchanges with other provinces.

6 Determinants of domestic border effects

This section studies the causes of the lack of integration of Chinese domestic market. Determinants of inter-provincial and inter-industry heterogeneity of domestic trade barriers are successively investigated through the direct regression of yearly provincial and industry-level border effects presented in previous section. Provincial domestic protectionism is apprehended under the rubric of endogenous policy theory as detailed in section 2.

Column 1 of table 3 introduces the provincial rate of total budgetary expenses to GDP, the lagged rate of unemployment and the share of public sector in total consumption as explanatory variables of provincial border effects in 1992 and 1997[23]. The Davidson-MacKinnon test does not reject the absence of double causality between provincial trade barriers and fiscal autonomy[24]. This regression considers a factor of demand for protection (pressure from the unemployed) beside a supply factor (financial and economic autonomy of authorities). The importance of the public sector in provincial consumption can be perceived at the same time as a supply force -reflecting the interventionist strategy of the authorities- and as a demand variable - corresponding to the weight of the public sector in the local economy. I have already mentioned that SOE are the most endangered by the liberalization process due to their chronic over-employment, low or negative profits rates and lack of competitiveness. Provincial authorities are thus compelled to protect their activities if bankruptcy and layoffs are to be avoided. Moreover SOE's privileged direct links with local powers facilitate lobbying pressures and blackmailing practices for greater tariffs protection.

[23]Budgetary and extra-budgetary expenses statistics are extracted from the New China 50 Year's Government Finance Statistics and the China Statistical Yearbooks. Unemployment and active population data are from the 1990 and 1995 population surveys.

[24]Lagged value of the indicator of fiscal autonomy as well as provincial surface area and population density are used as instruments. Their validity is not rejected by the test of overidentifying restrictions.

The rate of provincial total budgetary expenditures on GDP is held as a indicator of financial autonomy and economic control of the provincial government and thus indicates its ability to intervene in the economy despite central directives.

The lagged rate of unemployment constitutes another important motive for local governments to resort to protectionism. If China's economic reforms aimed at maximizing economic growth through marketization and privatization, massive layoffs ensued from increased competition. This new phenomenon represents a threat for local governments as it induces social unrest and loss of legitimacy. Trade protectionism may be considered as a way for provincial authorities to limit liberalization adjustments costs, reduce competition of more competitive outside products and curb unemployment growth.

Findings emphasize the positive link between greater provincial budgetary autonomy and higher barriers to inter-provincial trade. They confirm the dominant view in the studies of Chinese economy that attributes the rise of local protectionism and local substitution policies to the economic reforms that assigned greater fiscal flows and economic control to regional governments.

Zhao and Zhang (1999) describe the disastrous economic impact of decentralization reforms in China: "Fiscal decentralization has created conditions that encourage regionalism: disappearance of the traditional umbrella, unfairness to the poor regions, territorial segmentation and confrontation, central-local vertical confrontation, and failure of spatial programs of specialization and corporation".

Empirical results moreover confirm the causality existing between past employment rate and current protection of local economy from outside competition behind trade barriers. The more a province suffered from massive layoffs, the more the authorities are prompt to provide

protection to local activities.

Large adjustment costs (unemployment and bankruptcies of SOE), local activities economic vulnerability as well as the intervention capacity of authorities through fiscal expenses and public consumption turn out to be major determinants of inter-province heterogeneity of barriers on domestic trade. These three factors explain 29% of inter-provincial border effects variability.

Column 2 of table 3 studies the causal structure of inter-industry heterogeneity of impediments to domestic trade in China. High labor intensity[25] and fiscal contribution of an industry[26] positively influence the level of protection it is granted from local authorities. Protection levels enjoyed by industries appear to be directly related to their intensity in terms of employment. A large number of workers by production unit secures more influence in the decision-making process of domestic trade policy for an industry. It also ensures a greater attention from authorities, whether their priority is to minimize short-run adjustment costs, limit social inequity or garner maximum political support to maintain political stability. Since the labor intensity variable corresponds to the inverse of labor productivity, it is consistent with the fact that authorities protect in priority low-productivity industries which not only require more protection to survive increasing competition but also often lie under direct governmental control.

Additionally, governments tend to favor those industries that generate larger tax income. Chen and Feng (2000) evidence the same strategy in the context of international trade protection and stress that setting a higher tariff for an industry that is able to generate higher taxes is a "win-win game" for the authorities and the industry.

Domestic trade policy in China appears to be largely determined by two concerns of provin-

[25]Industry-level labor intensity is the number of worker per unit of production.

[26]This variable is computed as net taxes on production of the considered industry divided by total net taxes through industries.

cial authorities. The first concern stems from the governments' need to protect vulnerable and labor intensive enterprises (typically state-owned units). Higher domestic trade barriers are thus observed in provincial economies where the public sector plays a major role, where past unemployment rate is high and in sectors characterized by high labor intensity and low productivity. This strategy is all the critical to avoid political unrest and social chaos that the province is already crippled by a high unemployment rate. The second concern has to do with fiscal revenues extraction. In a context of fiscal decentralization, local governments tend to protect in priority big tax payers to maximize their intervention power.

7 Conclusion

This study applies the border effects method on a unique dataset of industry-level domestic trade flows between Chinese provinces to measure domestic market integration in China in 1992 and 1997. Our results underline the fragmentation of Chinese domestic economy and even the spread of local protectionism over the period. Rather than a single market, China appears as a collection of separate regional economies protected by barriers. These findings question China's future WTO compliance. International tariffs reduction does not secure free access to Chinese domestic market if provincial authorities maintain and even extend restrictions on inter-provincial trade.

The investigation of province-level and industry-level trade barriers confirms the relevance of applying the framework of endogenous protection to explain the level of impediments to trade between Chinese provinces. Empirical results emphasize that provinces' domestic trade protection pursues a dual objective of socio-economic stability preservation and fiscal revenues maximization.

Provincial barriers to domestic trade aim at minimizing the negative social, economic and political impacts of privatization and liberalization programs (layoffs, bankruptcies, declining profits...). Local protectionism thus occurs in the context of large economic autonomy of local authorities, high past unemployment rate, large public sector and high labor intensity industries.

The second objective concerns the extraction of tax revenues. Local authorities that gained substantial economic powers from the decentralization process are inclined to protect those industries that generate large tax income.

As far as political implications are concerned, if economic reforms can favor the reduction of internal barriers through the reduction of the public sector and the search of productivity gains, their disrupting effects (layoffs, losses of inefficient SOE, declining profits) put in movement destabilizing forces that impede domestic trade integration. Chinese central government faces great challenges in order to comply to WTO rules and promote domestic market integration. It has to strike a balance between economic reforms and inherent adjustments costs and to limit local governments economic interventionism.

APPENDIX

The estimation of internal trading distance has become the key issue in the border effects literature. Internal distance within an economic territory can be thought as the average trading distance between two random points in this territory. The averaging procedure should however be consistent with the gravity model. Equation 5 of the empirical model determines that gravity forces not only work between Chinese provinces and their outside partners but also inside Chinese provinces. Specifically, intra-provincial trade declines with the intra-provincial distance d_{ii} the same way that interprovincial trade declines with the inter-provincial distance.

Several approaches to measure within-unit distances currently coexist in the border effects literature[27]. I argue that none of the methods used so far to compute internal distances is appropriate since none is derived in a manner consistent with the gravity trade model. The model imposes a constant distance elasticity of trade θ that should be taken into account when calculating the average distance between two points. Simple average or production-weighted average of distances between sub-sets is not appropriate.

I develop a correct measure of intra-provincial distance directly derived from the gravity-like trade model without relying on arbitrary values of θ. The province i corresponds to a set of points. Let l and m be located in the province i. The average intra-provincial distance d_{ii} can be derived from the expression of m_{ii} in equation 3 of the model through the following two-step

[27]Initial papers (Wolf, 2000 and Wei, 1996) employ fractions of distances to the capital cities of neighbor countries. A second strand in the literature assumes that the country has a specific geographic shape and a specific spatial distribution of the activity in order to calculate the average distance among points within the country. If a disk-shape is assumed, the average distance will be a fraction of $\sqrt{surface\ area/\pi}$. A third and more desirable method relies on actual data on the spatial distribution of economic activity within the country rather than on approximations. Notably, Helliwell and Verdier (2001) calculate internal distances of Canadian provinces as the population-weighted average of intra-city, inter-city, city-to-rural-area and rural-area-to-rural-area distances.

aggregation:

$m_{ii} = \sum_{l\in i}\sum_{m\in i} m_{lm} = \sum_{l\in i}\sum_{m\in i} \frac{v_m d_{lm}^{-\theta} p_m^{-\sigma}}{\sum_k a_{lk}^{\sigma-1} v_k (B_{lk}(1+u)d_{lk})^{-\theta} p_k^{-\sigma}} m_l$

Calling I_i the denominator, I have $m_{ii}\sum_{l\in i}\sum_{m\in i}\frac{v_m d_{lm}^{-\theta} p_m^{-\sigma}}{VI_l} m_l$. I rely on the same methodology used to compute m_{i-roc} from the summation on all the provinces that form the rest of China. Approximating the weighted arithmetic mean $\sum_{m\in i}\frac{v_m}{\sum_{m\in i} v_m} d_{lm}^{-\theta} p_m^{-\sigma}$ by the weighted geometric mean $\prod_{m\in i}\left[d_{lm}^{-\theta} p_m^{-\sigma}\right]^{\frac{v_m}{\sum_{m\in i}}}$.

The absence of correlation between $d_{lm}^{-}\theta$ and $p_m^{-\sigma}$ gives equation 3*:

$m_{ii} = \sum_{l\in i}\frac{\sum_{m\in i} v_m \prod_{m\in i} d_{lm}^{-\frac{v_m}{v_i}\theta} \prod_{m\in i} p_m^{-\frac{v_m}{v_i}\sigma}}{VI_l} m_l$. Let's call p_i the formula for production price of i $\prod_m p_m^{\frac{v_m}{v_i}}$ that is independent of l and set $d_{li} = \prod_{m\in i} d_{lm}^{\frac{v_m}{v_i}}$. I rely on two hypotheses to transform equation 3* into something of the form: $m_{ii} = \frac{v_i d_{ii}^{-\theta} p_i^{-\sigma}}{VI_i} m_i$

The first hypothesis I make is that for every point l in the province i, its share in the total imports of the province i equals its share in the total production of the province i so that $\frac{m_l}{\sum_{l\in i} m_l} = \frac{m_l}{m_i} = \frac{v_l}{\sum_{l\in i} v_l} = \frac{v_l}{v_i}$. Multiplying equation 3* by $\frac{m_i}{m_i}$ I get:

$m_{ii} = v_i \sum_{l\in i}\frac{d_i^{-\theta} p_i^{-\sigma}}{VI_l} m_l \frac{m_i}{m_i} = v_i \sum_{l\in i}\frac{\frac{v_l}{v_i} d_i^{-\theta} p_i^{-\sigma}}{VI_l} m_i.$

At this point of the research, I accept a simplification about VI_l. VI_l incorporates the influence of characteristics of all potential suppliers k of importer l such as their economic size, distance and border effect. Potential suppliers k include suppliers from the province i and suppliers from the outside (rest of China and international partners). In the case of the suppliers k from outside the province, I can assume that the influence of their characteristics relative to l is equal to their influence relative to c with c being the center of the province i. As a matter of fact, I hypothesize that VI_l is the same for every l of the province i and is equal to VI_c.

Moreover I consider that the influence of characteristics of intra-provincial suppliers can be neglected compared to the influence of characteristics of outside partners[28]. I have expressed VI_l in a manner independent of l but dependent on the center c of the province i. In fact, I have considered that VI_l is an approximation to VI_i.

I therefore have $m_{ii} \approx \frac{v_i p_i^{-\sigma} m_i}{VI_i} \sum_{l \in i} \frac{v_l}{v_i} d_{li}^{-\theta}$. I approximate the weighted arithmetic mean $\sum_{l \in i} \frac{v_l}{v_i} d_{li}^{-\theta}$ by the weighted geometric mean $\prod_{l \in i} d_{li}^{-\theta \frac{v_l}{v_i}}$.

I obtain $m_{ii} \approx \frac{v_i p_i^{-\sigma} m_i}{VI_i} \prod_{l \in i} d_{li}^{-\theta \frac{v_l}{v_i}}$.

[28]International and interprovincial distances between the center of the province and outside partners are far greater than distances between two points of the province $d_{lk \ if \ k \in i}$. The same is true for the production value: the production of any international partner is far higher than the production of a point k in the province $v_{k \ if \ k \in i}$. Moreover the 'international' component of VI_l incorporates multiplicative positive terms (a_{lk} and $B_{lk}(1+u)$) that do not exist in the 'local' component.

REFERENCES

Baldwin, Robert E., "Trade Policies in Developing countries", in Ronald W. Jones and Peter B. Kenen, eds., *Handbook of International Economics*, Vol. 1. Amsterdam: North Hooland, 1984.

Bin, Sheng,"The Political Economy of Trade Policy in China", *Department of Management, Politics and Philosophy Working Paper. Copenhagen Business School,* 10/2000. Copenhagen Business School, 2000.

Branstetter, Lee G., and Robert C. Feenstra, "Trade and the Foreign Direct Investment in China: A political Economy Approach", *NBER Working Paper,* 7100, 1999.

Chen, Baizhu, and Yi Feng, "Openness and trade policy in China. An industrial analysis", *China Economic Review,* 11 (2000), 323-341.

Cheung, Peter T. Y., Jae Ho Chung, and Zimin Lin *Provincial strategies of economic reform in Post-Mao China. Leadership, politics and implementation.* Studies on Contemporary China. ME Sharpe. Armonk. New York, 1998.

China Statistical Yearbooks, National Bureau of Statistics. People's Republic of China. Beijing: China Statistical Press, Various issues.

Chinese Economic Studies, 26, fall 1993, issue on local protectionism.

Cities China 1949-1998, Xin Zhongguo Chengshi 50 Nian . National Bureau of Statistics. People's Republic of China. Beijing: Xinhua Press, 1999.

Dixit, Avinash, and Joseph E. Stiglitz "Monopolistic competition and optimum product diversity", *American Economic Review,* 67 (1977), 297-308.

Engel, Charles, and John H. Rogers, "How wide is the border?", *American Economic Review,* 86 (1996), 1112-1125.

Goodman, David S., and Gerald Segal *China deconstructs: Politics, Trade and Regionalism.* London. Routledge, 1994.

Grossman, Gene M., and Elhanan Helpman, "Protection for sale", *American Economic Review,* 134 (1994), 833-850.

Harrigan, James, "Openness to trade in manufactures in the OCDE", *Journal of international economics,* 40 (1999), 23-29.

Head, Keith, and John Ries, "Increasing Returns versus National Product Differentiation as an Explanation for the Pattern of US-Canada Trade", *American Economic Review,* forthcoming.

Head, Keith, and Thierry Mayer, "Non-Europe : The Magnitude and Causes of Market Fragmentation in the EU", *Weltwirtschaftliches Archiv,* 136 (2000), 284-314.

Helliwell, John F., "National Borders, Trade and Migration", *Pacific Economic Review*, Vol 2 (1997), 165-185.

Helliwell, John F., and Genevieve Verdier, "Measuring Internal Trade Distances: A new Method Applied to Estimate Provincial Border Effects in Canada", *Canadian Journal of Economics,* 34 (2001), 1024-1041.

Huang, Yasheng, "Economic Fragmentation and FDI in China", *Working Paper,* 374. Department of Business, Government International Economy. Harvard Business School, 2001.

Krugman, Paul R., "Scale economies, product differentiation, and the pattern of trade", *American Economic Review*, 70 (1980), 950-959.

Leamer, Edward E., "Access to Western Markets and Eastern Effort Levels", in *Lessons from the economic transition: Central and Eastern Europe in the 1990s*, Zecchini (ed.), Dordrecht: Kluwer Academic Publishers, 1997.

Long, Simon, "Regionalism in Fujian", Chapter 7, *China deconstructs: Politics, Trade and Regionalism.* Goodman D. S. G. & G. Segal, London: Routledge, 1994.

McCallum, John, "National Borders Matter: Canada-US Regional Trade Patterns", *American Economic Review,* 85 (1995), 615-623.

Naughton, Barry, "How much can regional integration do to unify China's markets?". Conference for Research on Economic Development and Policy Research, Stanford University, 1999.

New China 50 Year's Government Finance Statistics, Chief editor Lou Jiwei, Economic Science Press, Beijing, 2000.

Provincial Statistical Yearbooks, National Bureau of Statistics. People's Republic of China. Beijing: China Statistical Press, Various issues.

Rodrik, Dani, "Political Economy of Trade Policy", in Gene Grossman and Kenneth Rogoff eds., *Handbook of International Economics*, Vol. 3, Elsevier Science B. V, 1995.

Wei, Shang-Jin, "Intra-National Versus International Trade: How Stubborn Are Nations in Global Integration", *NBER Working Paper*, N°5531, 1996.

Wolf Holger C. (2000). Intranational Home Bias in Trade, *The Review of Economics and Statistics,* Vol. 82 (4), 555-63.

World Bank, "China: Internal Market Development and Regulation". Washington, DC: World Bank, 1994.

Yang, Dali L., *Beyond Beijing. liberalization and the regions in China,* Routledge Studies in China in Transition. Series Editor: David S. G. Goodman, 1997.

Young, Alwyn, "The Razor's Edge: Distorsions and incremental Reform in the People's Republic of China", *Quarterly Journal of Economics,* 115 (2000), 1091-1136.

Zhao, X B, and L Zhang, "Decentralization reforms and regionalism in China: a review", *International Regional Science Review,* 22 3 (1999), 251-281.

Table 1

MEASURE OF DOMESTIC BORDER EFFECTS IN CHINA

	Dependent Variable : $ln(\frac{m_{ij}}{m_{ii}})$				
	Column 1 Panel	Column 2 Panel	Column 3 Panel	Column 4 Panel	Column 5 Panel
Fixed Effects by	industry			industry-year	
Border Effect	-3.14*** (0.27)	-2.91*** (0.29)	-2.34*** (0.39)	-3.25*** (0.27)	-2.59*** (0.33)
rel. Production	0.81*** (0.03)	by industry	by year & industry	0.81*** (0.03)	0.83*** (0.03)
rel. Distance	-0.48*** (0.13)	by industry	by year & industry	-0.49*** (0.13)	-0.45*** (0.13)
rel. Price	-1.27*** (0.30)	by industry	by year & industry	-1.32*** (0.44)	-1.51*** (0.30)
Year 1997	-0.31*** (0.12)	-0.31*** (0.12)	-1.42** (0.58)		
% public sector consumption					-2.42* (1.4)
Obs. Nb.	987	987	987	987	987
R squared	0.39	0.41	0.43	0.39	0.40

Heteroskedastic consistent standard errors in parentheses,
with *** and * denoting the significance at 1 and 10% level.

Table 2

DOMESTIC BORDER EFFECTS BY IMPORTING PROVINCE AND INDUSTRY

by industry	border effects 1992	1997	by province	border effects 1992	1997
Electricity & hot water	-5.8***	-5.5***	**East:**		
Agriculture	-4.4***	-5.0***	Beijing	-3.0***	-3.3***
Building Materials	-4.0***	-4.3***	Tianjin	-2.4**	-2.9***
Metal products	-3.7***	-4.5***	Hebei	-1.7	-1.6***
Paper and printing	-3.4***	-3.4***	Shanghai	-1.9	-2.8***
Coal mining	-3.3***	-4.0***	Jiangsu	-1.1	-1.7
Oil extraction	-3.3***	-2.6***	Zhejiang	-3.5***	-4.6***
Sawmills and furniture	-3.2***	-4.0***	Fujian	-4.6***	-6.3***
Textile	-3.1***	-3.3***	Shandong	-3.2***	n.d.
Apparel	-3.0***	-3.1***	Guangdong	-1.9	-1.7
Electric equip. & machinery	-3.0***	-3.1***	Guangxi	-3.0***	-2.7***
Instruments	-2.9***	-2.8***	Liaoning	-2.8***	-3.0***
Food manufacture	-2.8***	-3.6***	**Center:**		
Non-ferrous mineral mining	-2.7***	-3.4***	Shanxi	-4.3***	-4.3***
Transport equip.	-2.7***	-3.0***	Jilin	-1.4	-2.4***
Machinery & equip.	-2.6***	-2.7***	Jiangxi	-3.3***	-2.9***
Chemicals	-2.5***	-3.0***	Henan	-2.8***	-3.3***
Metal ore mining	-2.3***	-3.0***	Hubei	-2.3*	-3.2***
Oil processing & Coking	-2.3***	-2.7***	Hunan	-2.6***	-3.1***
Metals smelting & pressing	-2.3***	-2.5***	I. Mongolia	n.d.	-3.5***
Electronic & telecom	-1.9***	-1.7***	**West:**		
			Sichuan	-3.5***	-4.3***
			Guizhou	-3.8***	n.d.
			Yunnan	-4.1***	-3.4***
			Shaanxi	-3.0***	-3.0***
			Gansu	-3.6***	-3.6***
			Qinghai	-5.6***	-5.3***
			Ningxia	-3.8***	-4.0***
			Xinjiang	-3.6***	-3.4***

Heteroskedastic consistent standard errors in parentheses,
with ***, ** and * denoting the significance at 1, 5 and 10% level.

Table 3

PROVINCIAL AND INDUSTRY-LEVEL DETERMINANTS OF BORDER EFFECTS

Dependent Variable: Border Effect			
province-year		industry-year	
province characteristics		industry characteristics	
Constant	-8.93***	Constant	-8.08***
	(1.44)		(1.37)
1997 dummy	0.34	1997 dummy	-0.70**
	(0.32)		(0.29)
Ln Fiscal Autonomy	-0.81*	Ln Labor	-0.44***
	(0.45)	Intensity	(0.14)
Ln Unemployment Rate	-0.92**	Ln Fiscal	-0.12*
	(0.41)	Contribution	(0.06)
Ln Importance of Public	-0.85**		
Consumption	(0.39)		
Number of Observations	49		42
R squared	0.29		0.21

Heteroskedastic consistent standard errors in parentheses,
with ***, ** and * denoting significance at the 1, 5 and 10% level.